RESEARCH ON THE EDUCATION OF VISUALLY HANDICAPPED CHILDREN

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Research on the Education of Visually Handicapped Children:

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Section I - Braille Readers

The material described in this section emphasizes results of studies applicable to those groups among visually handicapped children who characteristically employ Braille as an educational medium. From the communication standpoint, these groups predominately utilize tactile and auditory channels. As of 1 January 1960, 8,503 such children were enrolled in public school programs.*

The research covered varies widely in quality of design, execution, analysis, and description. To a great extent, this variability in quality reflects the historical fact that research in this area has been largely a product of opportunity. While several schools and organizations have supported continuous investigation over long temporal intervals, the bulk of published reports describes a single effort made by a single individual at some opportune time during his career. This condition appears to be the greatest single factor contributing to the present lack of integration of research in the field.

In the interests of organization, the material has been loosely arranged under six headings. It is hoped that this arrangement will enable the reader to approach the material with greater facility. Research areas are described in the following order:

1. Sensory and Perceptual Factors Relevant to Education.
2. Educational Media and Their Uses.
3. Intelligence and Its Measurement.
4. Educational Development and Its Measurement.

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* Hooper, M. S. The preparation and distribution of textbooks for blind children, Unpublished manuscript, Louisville, The American Printing House for the Blind, 1960.

5. Personality and Social Development and Their Measurement.

6. Physical Performance and Its Measurement.

The reference cited for any given study is that which the author believed to be most widely available.

1. Sensory and Perceptual Factors Relevant to Education.

Because blind children are restricted in sensory input, interest arose early in describing the effects of this condition from a dynamic perceptual standpoint. The implications of restriction of visual sensitivity for the functioning of other sense avenues have held wide interest. Investigations of sensory and perceptual processes important to specific behavioral areas such as communication, learning, and mobility have been made.

a. Seashore, C. E. & Ling, T. L. The comparative sensitiveness of blind and seeing persons, Psychol. Monogr., 1918, 25, 148-158.

Purpose: To compare blind and sighted groups for auditory, tactual, and kinesthetic sensitivity.

Subjects: 16 high school students, ages 16-26 years, who had been totally blind for more than 5 years and 15 sighted high school students ages 14-19 years.

Procedure: The groups were compared on ability to (a) identify the direction of a sound source in a horizontal perimeter, (b) discriminate the intensities of pairs of tones, (c) discriminate weights using the method of constant stimuli, (d) discriminate passive pressure, and (e) discriminate active pressure. The two point threshold on the tip of the first finger and the inside of the forearm was also determined.

Results:

1. No differences existed between blind and sighted groups in any of the measures obtained.

2. "Development of the use of a sense consists not in the heightening of sensitivity or sensory discrimination but in the development of complexes and meanings in terms of these."

Comment: This study represents an early attempt to test the theory of "sensory compensation" and its implications for behavior of the blind. Broadly conceived, this theory held that loss in one sense area was compensated by development of hypersensitivity in other sense areas.

b. Axelrod, S. Effects of early blindness. Performance of blind and sighted children on tactile and auditory tasks. New York, American Foundation for the Blind, 1959.

Purpose: To compare the performance of early blinded, late blinded, and sighted children on simple and complex tactile and auditory tasks.

Subjects: 82 children blinded before 18 months of age, ages 108-236 months and IQs ranging 79-162, were matched with 82 sighted children. A group of 20 late-blind children, ages 111-248 months and IQs ranging 80-147 were also studied.

Procedure: Early blind and sighted groups were compared on (1) light-touch and two-point thresholds on the right and left index fingers and the ring finger of the preferred hand, (2) performance on two complex tactile tasks and one complex auditory task involving the ability to derive relationships among objects or stimuli presented, and (3) the ability to transfer a solution from a problem presented in one sense modality to its analogue presented in another. The late blind group was included in the latter two comparisons.

Results:

1. The early blind had lower two-point limens than sighted matches, although this difference was related to sex and finger. Such increased sensitivity (on the right index finger) did not appear related to Braille reading habits.

2. Early blind subjects were inferior in performance to sighted subjects when (a) required to abstract a characteristic common to rewarded members of pairs of

objects, (b) required to solve matching problems in which the correct choice among three palpated objects or three auditory stimuli was the object or stimulus identical to the one intermediate in space or temporal sequence, and (c) on a learning set task involving the transfer of a principle of solution from the matching problem presented haptically to an analogous one presented aurally or vice versa.

3. No differences existed between performance of the late-blind and that of the other groups except in the case of the tactile matching test where performance of the late-blind was significantly better than that of the early blind.

Comment: The differences in two-point threshold found in this study raise again the question of sensory compensation. Questions of more importance are raised by the finding of consistent superiority of the sighted group in the learning tasks: What are the effects of early sensory deprivation, particularly visual deprivation, for later learning and problem solving?

c. Nolan, C. Y. Roughness discrimination among blind children in the primary grades. Int. J. educ. Blind, 1960, 9, 97-100.

Purpose: To study variation in ability to discriminate degrees of differences in roughness among blind children in grades kindergarten through four.

Subjects: 94 children from 4 schools for the blind who read Braille or were considered potential Braille readers. These included 54 boys and 40 girls ranging in age from 5 years, 4 months to 13 years, 6 months.

Procedure: The stimuli consisted of 4-inch squares of 14 grades of sandpaper which were paired to make 27 test items. No pair of papers for any item was more than 3 grades apart. The test was administered individually to children who were required to identify the rougher square. One group of 31 children was retested after one year.

Results:

1. The ability to discriminate roughness was found not to be related to chronological age.

2. Significant differences among the mean scores for grades were found with means increasing with grade assignment.

3. A significant mean increase in score was found for a group retested after one year.

Comment: These results concerning a basic sensory dimension, tactile sensitivity, may have important implications for understanding readiness in Braille reading. If in addition to required mental age, the minimum tactual development level necessary for successful introduction to Braille reading can be specified, this part of education may be made more efficient.

d. Schlaegel, T. F., Jr. The dominant method of imagery in blind as compared to sighted adolescents. J. genet. Psychol., 1953, 83, 265-277.

Purpose: To determine the role of visual acuity and of age of onset of blindness on the imagery employed by blind and sighted adolescents.

Subjects: 67 blind children from Indiana School for the Blind, ages 12-24 years and 78 sighted high school students, ages 14-18 years.

Procedure: Groups were administered the Griffitts test of "concrete imagery" which consisted of 125 words or phrases given orally. The subjects responded by writing down the type of their first image. (visual, auditory, kinesthetic, tactual, thermal, olfactory, or gustatory.)

Results:

1. When averages of the blind and the sighted groups were considered as wholes, they were both equal and the relative dominance of imagery was the same for both in the following decreasing order: visual, auditory, kinesthetic, tactual-thermal, and olfactory-gustatory.

2. When the blind were divided on the basis of present vision and visual history, these differences were found: (a) Those subjects with poorest vision had the least number of visual and the most number of auditory responses; (b) As visual acuity increased, there was an average increase in visual imagery responses to an extent even greater than that of normal controls; (c) If the onset of visual loss was before

age six, visual imagery tended to disappear, this being most pronounced in those subjects with poorest vision.

Comment: The consequences for behavior of the mode of imagery employed in perception have been barely touched upon. These results have important implications for research and education in that they identify an important factor contributing to hetereogeniety among the blind, i.e., whether an individual's mode of imagery is characteristically visual, haptic, or auditory.

e. Worchel, P. Space perception and orientation in the blind. Psychol. Monogr., 1951, 65, No. 15, 28 p.

Purpose: To determine the role of visualization in the ability of the blind to perceive and manipulate spatial relations tactually and to orient themselves spatially.

Subjects: 33 totally blind and 33 sighted pupils matched for sex and chronological age.

Procedure: Exper. I: The methods of reproduction (drawing) and of verbal description were used in testing perception of simple geometric forms when handled by (a) one hand and (b) both hands. Recognition of a stimulus form (using both hands) from among four response forms was required.

Exper. II: The subjects were given two stimulus forms (one in each hand) and required to indicate which of four response forms would result from their combination.

Exper. III: The subjects were required to return to an initial starting position via a straight path after having been led along a right-angle path (right-angle isosceles triangle) and via a right-angle path after having been led along a straight path.

Results:

1. The sighted subjects were superior to the blind in tactual form perception as measured through reproduction by drawing and verbal description, in the imaginal manipulation of space relations and in space orientation.

2. The blind did as well as the sighted in the recognition of tactual form.

3. The accidentally blinded surpassed the congenitally blinded in tactual form perception (reproduction and verbal report), in the space relations test; and equaled the congenitally blind in the recognition of tactual form and in space orientation.

4. There was a significant and high correlation between age at blinding and (1) tactual form reproduction and description, and (2) the manipulation of space relations.

5. Sex differences were in favor of the males, but the differences were not significant in any of the tests.

6. For the blind subjects, chronological age was significantly related to performance in the space relations test; in all the other tests, there was no relationship between chronological age and performance.

7. The ability to translate tactile-kinesthetic impressions into visual imagery gave significantly better scores in all of the tests of form perception except recognition and space orientation.

8. In the space orientation tests, visual imagery was important in directional orientation, but the estimation of time was fundamental in distance orientation for both the blind and the sighted subjects.

Comment: This comparative study of abilities of blind and sighted groups in spatial relationships and spatial orientation points out the importance in perception of the modes of imagery available to the individual. Possession of visual imagery appears to be a marked advantage. The implication for education is that the age of onset of blindness and the degree of visual handicap seriously effect the manner in which perceptual processes become organized.

f. Supa, M., Cotzin, M. & Dallenbach, K. M. "Facial vision": the perception of obstacles by the blind. Amer. J. Psychol. 1944, 57, 133-183.

Purpose: To determine the necessary and sufficient conditions for the perception of obstacles by the blind.

Subjects: Two blind and two sighted adults; the blind subjects possessed the

ability to perceive obstacles from a distance and daily utilized this ability. At the start of the experiments the sighted subjects lacked this ability.

Procedure: Experiments 1-6: The blindfolded subject was placed at varying distances in front of the obstacle (4'10" x 4' masonite board with lower edge 2' from the floor), (in Experiments 1 and 7 a wall served as the obstacle), and was instructed to walk toward it, to respond when the obstacle was first perceived, and next to approach as near as possible without touching and respond again. Distances at response points were recorded. The first 5 experiments were repeated twice, once with the subjects wearing shoes and walking on a hardwood floor and once in stocking feet on a soft carpet runner. The order of the repetitions was counterbalanced. Each experiment consisted of 25 successful trials (no contacts with obstacle) or 50 consecutive failures. When failures were interspersed with successes, trials were continued until the successes reached 25. Four (4) preliminary experiments were run to familiarize the subjects with the experimental conditions and to teach sighted subjects obstacle perception. False trials (no obstacle) were introduced in Experiment 3. For Experiment 4, all exposed areas of the skin were covered; for Experiment 5, the ears were plugged and the pinna was securely covered; for Experiment 6, the subject was stimulated aurally (earphones) by a continuous 1000-cycle tone; and for Experiment 7, the subject was placed in a soundproof room, and judged the experimenter's approach to the obstacle through sound transmitted from a microphone held by the experimenter to earphones on the subject.

Results:

1. Stimulation of the face and other exposed areas of the skin by air and sound waves was neither a necessary or sufficient condition for perception of obstacles by the subjects.

2. Stimulation of the skin by reflected breath was neither a necessary condition nor, as far as 'facial pressure' was concerned, a sufficient condition for determining extreme nearness of the obstacle.

3. The pressure theory of the obstacle sense, insofar as it applies to the face and other exposed areas of the skin, appeared to be untenable.

4. Aural stimulation appeared to be both a necessary and a sufficient condition for the perception of obstacles by the subjects.

Comment: Although this particular study does not employ children as subjects, it has important bearing on development of methods to teach children mobility. This study was the first of a series (carried out principally by Worchel and his coworkers) that clearly defined the role of hearing in obstacle avoidance.

Summary: The studies above are examples of the many diverse topics in this area which have attracted the fleeting attention of research workers. However, much more information describing basic sensory and perceptual processes in the blind is needed before many educational problems can be solved. Too many times in the past these processes have been assumed to be direct analogues of visual processes. Many of the wrong turns taken down the educational path can be attributed to such thinking. A number of issues in this area as well as much past research are effectively described in the monograph by Axelrod.

2. Educational Media and Their Uses:

As indicated earlier the tactile and auditory senses are the major avenues of communication for the education of blind children. It is only to be expected that a significant area of research should concern media for these two channels. Braille and recorded materials constitute the principal media used for textbooks. The following studies deal principally with these.

a. Meyers, E., Ethington, D., & Ashcroft, S. Readability of Braille as a function of three spacing variables. J. appl. Psychol., 1958, 42, 163-165.

Purpose: To compare the readability of Braille in which the spacings between dots within cells, between cells, and between lines were varied over three distances for each.

Subjects: 108 blind children in grades 5-12 were divided into 27 groups of four each matched on reading ability for Braille with standard spacing.

Procedure: Each subject read silently eight chapters from THE BLACK ARROW for two 50 minute periods on successive days. Time to read each page was recorded for each subject. At the end of the second day a 30-item comprehension test was administered. Each group read 1 of 27 possible combinations of Braille produced by varying the space between dots (.080", .090", .100"), the space between cells (.123", .140", .160") and the space between lines (.163", .220", .300"). Underlined values represent those of standard Braille.

Results:

1. Average reading speed for standard Braille was found to be 63 wpm (range 5-195 wpm).

2. Dot spacing of .080" was inferior to .090" or .100", there being no difference between the latter two.

3. Cell spacing of .123" or possibly .140" was more readable than .160".

4. Line spacing of .220" was more readable than either of the other values.

Comment: The configuration of punctiform writing was the subject of violent and bitter controversy during the first two decades of this century. Some points regarding the contraction of Braille and its technical specialization for subjects such as mathematics and arithmetic have yet to be resolved. This study effectively demonstrates, however, that there is little room for improvement in the dimensions of Braille printing.

b. Holland, E. F. & Eatman, P. F. Silent reading habits of blind children, Teachers Forum (Blind), 1933, 6, 4-11.

Purpose: To discover the differences in performance of good and poor Braille readers and to analyze the reading procedures of individual subjects.

Subjects: 28 children - four each from grades 3, 4, 6, 7, 8, 9, and 11. Two from each grade had been rated as good readers and two as poor readers by teachers

of reading.

Procedure: A constant-speed camera was used to photograph the hands of readers at the rate of one frame/.20 sec. These pictures were projected on the reading material, the position of fingers marked, and the reading rate calculated. The subjects read a selection from the Stanford Achievement Test at the 8-year-old level of difficulty. They were directed to read the material once, and, at the end, to pronounce or call out a word left out of the selection. This response was used as a comprehension check. Total time required was approximately 10 minutes per subject.

Measures taken were (1) the total number of exposures per line; (2) the average number of Braille cells read by the left and right hands independently; (3) the time spent by subjects at the beginning and the end of each line; (4) the number of regressive movements; and (5) the time spent by subjects making "return sweeps".

Results:

1. The performance of poor readers was more variable than that of good readers.
2. Great variability existed in hand preference and finger preference, as well as in coordination of hand movements.
3. The left and right fingers read a large amount of material independently. Good readers read more material with the right hand and the amount of material read by the left finger was less than that read by the right.
4. More time was spent at the beginning than at the end of lines; good readers spent less time at the end than at the beginning; poor readers spent more time at the end than at the beginning.
5. More regressive movements were made by the left hand than the right; good readers made fewer regressive movements than did poor readers.
6. 6-7% of the time was spent making return sweeps. Good readers spent less time than poor; good readers spent less time making return sweeps with the left hand than the right; the reverse was true for poor readers.

Comment: (at the end of reference d)

c. Holland, B. F. Speed and pressure factors in Braille reading. Teachers Forum (Blind), 1934-35, 7, 13-17.

Purpose: To investigate the relation of pressure to speed in Braille reading.

Subjects: 17 slow and 17 fast readers, grades 4-10, selected on the basis of photographic records of finger movements while reading.

Procedure: The subjects read (1) a practice selection and (2) an experimental selection taken from the Stanford Achievement Reading Test under instruction to read as usual. Time and pressure were recorded using a kymograph.

Results:

1. Fast readers tended to use less pressure while reading Braille than did slow readers.
2. Correlation between pressure and speed was rho = .27.
3. Amount of pressure varied within a given line. Pressure at the beginning of a line was less than at the end. Fast readers showed less variation.
4. Poor readers tended to increase the amount of pressure as they read through a paragraph.

Comment: (at end of reference d)

d. Fertsch, P. Hand dominance in reading Braille. Amer. J. Psychol., 1947, 60, 335-49.

Purpose: To investigate the problem of handedness and hand dominance in Braille reading.

Subjects: 33 blind boys and 30 blind girls of average or above average intelligence who scored in the upper or lower thirds on the Monroe test of reading comprehension.

Procedure: Determination of hand dominance: Using the Shank Test of Reading Comprehension, the reading performance of each hand was tested separately. Measures of both reading time and comprehension were obtained.

Determination of the method of reading: Motion picture records of reading

performance were obtained during both oral and silent reading. Comprehension was tested.

Determination of handedness: A hand dynamometer was used to determine handedness through the correlation of hand-strength and hand preference. Not enough left-handed persons were available for study.

Results:

1. On the basis of performance when the hands read separately, blind readers may be classified into "right-dominant", "left-dominant", and "hands equal" groups.
2. The "hands equal" group read a larger number of Braille cells with the hands functioning independently, read faster, and contained fewer poor readers than the other two groups.
3. The "right-dominant" group read almost as many Braille cells with the hands separate and almost as fast as the "hands equal" group and contained an equal number of good and poor readers.
4. The "left-dominant" group read a small amount of material with the hands functioning independently, read slowest of the three groups, and contained twice as many poor readers as good readers.
5. Good readers read a substantial amount of material with the hands functioning independently and of this about twice as much with the right hand as the left.
6. Poor readers kept the right and left fingers close together and consequently read very little with the hands independently.

Comment: References b-d are examples of studies carried out for the purpose of describing the mechanics of Braille reading. These reports demonstrate a research method which has as its goal finding the best methods for performance of a skill, i.e., comparing the methods used by poorly and highly skilled performers.

e. Ashcroft, S. C. Errors in oral reading of Braille at elementary grade levels. Doctoral thesis, Univ. Illinois, 1960.

Purpose: To study the oral performance of children reading Braille in order

to identify errors and classify these according to type, frequency, and grade level.

Subjects: Seven-hundred forty-eight tactual Braille readers of both sexes in grades 2-6 who did not possess additional handicaps that would seriously effect their reading behavior.

Procedure: Subjects were required to read 12 simple passages of graded reading difficulty which were designed to include almost all of the 185 signs, abbreviations, and contractions of Braille as they commonly occur. The material was presented individually and errors made were recorded verbatim according to a standardized procedure.

Results:

1. Eight types of errors were found related to the use of Braille by the subjects. The types of errors together with their relative percents of occurrence were: missed dots, 16%; ending problems, 15%; reversals, 13%; added dots, 13%; association, 12%; gross substitutions, 12%; up and down alignment, 10%; and left and right alignment, 9%.

2. From the standpoint of mode of Braille spelling (orthography), order of categories of orthography involving most to least number of errors was: short form words, multiple cell contractions, combinations of orthography, lower contractions, upper contractions, full spelling, and alphabet abbreviations. The first three categories above included only 28% of the total number of the words but contributed 46% of the total number of errors made.

3. From the behavioral standpoint, the eight error types could be classified as arising from problems of perception (missed dots, added dots, and ending problems), problems of orientation (reversals, vertical alignment and horizontal alignment), and from problems of memory (association errors and gross substitutions).

Comment: This study is an example of descriptive and analytical research which has as its primary purpose the identification of specific problems for future study. Most experimental studies are based upon hypothesis derived from the description and analysis of complex behavior patterns. Ashcroft suggests a number of pregnant hypothesis concerning Braille reading which could be tested experimentally.

f. Enc, M. A. & Stolurow, L. M. The effect of two recording speeds on learning. New Outlook Blind, 1960, 54, 39-48.

Purpose: To test the hypothesis: Comprehension of auditory information is positively correlated with word rate within limits due to effect of temporal contiguity.

Subjects: 23 seventh and eighth grade blind children, ages 13-17 years with IQs ranging from 89-144.

Procedure: Ten 1300-1400 word stories were recorded at slow (174 wpm) and fast (211 wpm) word rates. A 20 item multiple choice comprehension test was available for each. The subjects were divided into three groups. Groups I and II alternated in hearing the fast or slow version of an identical story which was changed on each of ten days. Group III heard no story. Retention for story content was tested immediately and 24 hours after hearing. Group III was tested similarly at the same time.

Results:

1. The groups which heard the stories scored significantly higher on the test than the group which heard no stories.
2. For 9 out of 10 stories the group hearing the faster story received a significantly higher test score immediately after hearing.
3. For 13 out of 14 children the means based on the fast stories were higher than those based on the slow stories.
4. Results for retention after 24 hours were the same as for immediate retention.

Comment: A major problem for blind children is the restriction in rate of communication imposed by use of Braille (average 68 words per minute) or recordings (average approximately 150 words per minute) for presentation of textbook materials. In this study, the authors are studying the relationships between rate of communication and the efficiency of comprehension and retention for a series of stories. The findings indicate that further research in auditory communication and listening techniques could be fruitful.

g. Merry, R. V. & Merry, F. K. Tactual recognition of embossed pictures by blind children, J. app. Psychol., 1933, 17, 148-163.

Purpose: To determine how well blind children can recognize two and three dimensional embossed pictures and to investigate the effects of training in perspective and graphic representation upon this ability.

Subjects: 49 boys and 49 girls, with no useful vision. Ages ranged from 6-24 years, IQs 61-146, and grades from K-12.

Procedure: Exper. I; The subjects were presented with 5 two-dimensional designs and 10 three-dimensional objects embossed in paper and were asked to name them. Exper. II; The subjects were given one or more months training in comparing objects with their two and three dimensional embossed representations.

Results:

Exper. I:

1. The ability of children to recognize tactually simple embossed designs and pictures was quite limited (16 got 0 scores on pictures).
2. Simple embossed designs (square, circle, etc.) were recognized more often than were embossed pictures of tri-dimensional objects (house, table, etc.).
3. Positive relationships were found between (a) speed of response and total score and (b) IQ and the ability to recognize two-dimensional designs.
4. The age at which vision was lost was not related to this ability.

Exper. II:

1. Instruction in designs representing two-dimensional objects resulted in improvement for most children (range 0-95%, median 20%).
2. Instruction in recognizing embossed representations of three-dimensional objects resulted in improvement ranging from -20% - 50%, median 20%. The greatest improvement occurred for older children (range 10-50%).

Comment: Since the beginning of embossed printing, there has been an interest in developing means of presenting pictorial information to the blind. Most attempts have employed tactual analogues of visual techniques for doing this.

Generally results were comparable to those of the above study. This is one of many examples in research where application of visual models for perception in developments for the blind has had negative results.

Summary: If a few superficial studies of arithmetic media are included, the topics above exhaust the variety of research under this heading. Unfortunately, developments in media are often dependent upon rather exact information concerning sensory and perceptual processes. As indicated earlier, little specific data on these topics are available with respect to the blind. Advances in graphic communication methods for the tactual sense modality are particularly impeded by this lack.

The existence of educational media implies that educational methods for teaching children to use them are available. No major research on development or evaluation of educational methods for blind children has been conducted.

3. Intelligence and Its Measurement.

Interest in measuring the intelligence of blind children arose as early as 1914 with adaptation of the early Simon-Binet scales. Then, as now, problems of validity were major among those faced by the researchers. Items on tests designed for sighted persons often lacked content (face) validity for the blind. Necessary changes in methods of test administration together with item changes as a consequence of lack of content validity meant that sighted norms were no longer usable. Therefore, tests lacked concurrent validity also. The studies described below are representative of the types of research efforts made in this area.

a. Hayes, S. P. A second test scale for the mental measurement of the visually handicapped; the Interim Hayes-Binet Intelligence Tests for the Blind, 1942 Revision. Outlook for the Blind, 1943, 37, 37-41.

Purpose: To describe results of the early use of the 1942 Interim Hayes-Binet Intelligence Tests for the Blind.

Subjects: 119 children in grades 7-12 from the Upper School at Perkins Institute.

Procedure: The scale is a tentative selection of test items from the 1937 Stanford-Binet. It includes items from both forms L and M and is arranged, administered, scored, and interpreted similarly.

Results:

1. The IQ distribution for blind children approached a normal distribution.
2. The corrected split-half reliability was .91.
3. IQs obtained correlate .95 with IQs obtained from the Wechsler-Bellevue Verbal Scale.
4. IQs were highly related to school status and achievement test scores.

Comment: The Interim Hayes-Binet remains the most widely used intelligence test adapted for blind children. One of the aims in adapting this test was to achieve at each age level, a distribution of intelligence quotients with a mean of 100. In order to achieve this, age levels for some items were changed from those assigned in the 1937 Stanford-Binet. This means, of course, that scores for the two tests do not have the same meaning.

b. Hayes, S. P. Alternative scales for the mental measurement of the visually handicapped. Outlook for the Blind, 1942, 36, 225-230.

Purpose: To describe the adequacy of the Wechsler-Bellevue Scale, Form I, when used with the blind.

Subjects: Approximately 120 pupils, 14 years of age and above, from the Perkins School for the Blind.

Procedure: Pupils' scores on the Wechsler-Bellevue verbal scales were compared with their scores on other tests and with test scores obtained by other groups. Validity and item statistics of the Wechsler were studied.

Results:

1. IQ's obtained with this test were normally distributed with a range from 50-138.
2. IQ's obtained from the Wechsler verbal scales were correlated .85 with scores obtained with the Hayes-Binet and were correlated .70 with scores obtained from the Stanford Achievement Tests.

3. No reliability estimate was obtained but between sub-test correlations were comparable with those obtained by Wechsler and ranged from .54-.78.

4. Some items appeared to be at different levels of difficulty for the blind than for the sighted.

Comment: Although some questions concerning the validity for the blind of certain test items have arisen, the Wechsler Intelligence Scales in their various forms have been widely employed in testing blind children. A further criticism of the use of these tests is that the performance aspects of intellectual functioning are ignored.

c. Wattron, J. B. A suggested performance test of intelligence. New Outlook Blind, 1956, 50, 115-121.

Purpose:

1. To construct an adequate adaptation of the Kohs-type blocks which could be manipulated conveniently by blind subjects.

2. To compare scores of a blind group on this test with a known criterion of intelligence.

3. To compare scores on this test of a blind group and a sighted group.

Subjects: 10 male and 10 female totally blind students (7-17 years old) and 20 sighted subjects matched with the first group on sex and age.

Procedure: The test used duplicated the Kohs-blocks except red surfaces were rough and white surfaces were smooth. The subjects duplicated the designs employing 4 and 9 blocks. Interim Hayes-Binet scores were obtained on blind students. Sighted students duplicated the designs through a screening device which eliminated visual cues.

Results:

1. The adapted test materials were found to be practical for handling by blind subjects in preliminary trials.

2. Correlations between scores on the block tests and those derived from the Interim Hayes-Binet were .84 with a standard error of .067.

3. No significant differences were found between scores of the blind and sighted groups.

Comment: Because most performance test items included in standard intelligence tests require vision for their solution, the number of performance items which can be used to test blind children is small. Generally speaking, no good performance tests of intelligence for blind children are presently available. As this study shows, development of such tests is possible. Currently efforts are underway to develop and standardize performance scales for use with this group.

d. Sargent, R. F. The Otis Classification Test - Form A, Part II, adapted for use with classes of blind children. Teachers Forum (Blind), 1931, 4, 30-33.

Purpose: To describe the adaptation of the Otis Test for use with blind children.

Subjects: 210 pupils from Pennsylvania Institution for the Instruction of the Blind and from Perkins Institute, ages 10-36 years, and grades 5-11. IQ's ranged from 69-145, and were obtained using the 1923 Irwin-Hayes Binet Tests.

Procedure: Items were eliminated if (a) they could not be done conveniently without the aid of vision, (b) they involved visual experience as a background, or (c) a large percentage of failure among blind children known to be normal indicated that they were abnormally difficult for the blind. Forty-one items of the original 75 were retained.

Results:

1. Scores showed a correlation of .59 with IQ's and .76 with MA.

2. "The curves of median scores by grades, by chronological age, and by mental age all show a fair upward trend....the curve(s) and correlation(s) seem quite satisfactory and indicate this adaptation will probably function well in surveys of general intelligence in classes for the blind."

Comment: No good group tests of intelligence are available for use with blind children. A reason may be the length of time required for administration because of slowness of Braille reading. This study illustrates the problem of content validity in the adaptation of standardized tests for use with the blind. Modification of sighted tests to the extent illustrated by this study renders scores obtained meaningless unless new norms are developed.

e. Komisar, D. & MacDonnell, M. Gains in IQ for students attending a school for the blind. Except. Child., 1955, 21, 127-129.

Purpose: To analyze differences among test-retest scores for intelligence obtained at varying lengths of time from the blind.

Subjects: 89 students from Oak Hill School.

Procedure: The subjects were tested with the Hayes-Binet or WISC and at some later interval retested with either of these tests.

Results:

1. The group showed a significant gain in IQ (6.3 points) upon retesting after at least one year (range 1-4 years).
2. Gains tended to increase with length of time of attendance.
3. Children in lower IQ categories showed most gain, but substantial gains were shown by some children in other categories.
4. Results are interpreted to result from the enriched program for blind children available at a residential school.

Comment: Stability of IQ is a much greater problem with blind children than with sighted children. This is particularly true with very young blind children. Because many such children spend their pre-school years in environments which may be deprived culturally, emotionally, and physically, early test scores may significantly underestimate their potential. The results of this study illustrate the consequence of exposure to a favorable environment on the stability of intelligence quotients.

Summary: In spite of validity problems, adaptations of intelligence tests have played an important role in the education of blind children over the last four decades. Use of such tests makes possible a reliable ranking of blind children, from high to low, along an intellectual continuum; norms relative to this particular group have been roughly determined; and in the case of the Wechsler Scales a direct comparison with the performance of sighted groups can be made. Therefore, such tests can be of great use in the tasks of educational placement and educational planning. Successful use of tests in this manner have led to a general complacency over the validity problem. Testers loose sight of the fact that the IQ of a blind child derived from an adapted test often does not have the same meaning as an equivalent IQ of a sighted child derived from the original standardized version.

4. Educational Development and Its Measurement.

Research on educational development of blind children was started about 1920. Although most subject areas have been touched upon at one time or another, the area of language development has been of major interest. Major vehicles for such research have been standardized achievement tests which have been adapted for use by the blind. While most achievement tests are content valid for this group, the concurrent validity of many of them is open to question. Adaptation of achievement tests for the blind requires changes in mode of administration, test format, and test timing. Thus, results of a direct comparison of achievement of blind groups and sighted groups upon the basis of test scores may be ambiguous. In spite of this difficulty, achievement tests can contribute valuable information when blind children serve as their own norms under conditions of repeated testing.

a. Hayes, S. P. Stanford Achievement Tests for the blind; New and Old. Teachers Forum (Blind), 1941, 14, 2-15.

Purpose: To describe results of use of Forms V, W, X, Y, and Z with blind

children and give directions for use of Forms D, E, F, G, and H.

Subjects: 600 pupils in grades 4-9 from 9 residential schools for the blind tested during 1935-40.

Procedure: Tests were administered routinely to classes during this period. Braille adaptations were used.

Results:

1. Test-retest reliabilities ranged from .92-.96.
2. Achievement-mental age correlations ranged from .75-.95.
3. Inter-correlations between subject-matter tests ranged from .66-.93.
4. Achievement curves for all subject matter tests closely follow those for the sighted norm group except for Arithmetic Computation where the blind fell considerably below the sighted standards.

Comment: The Stanford Achievement Tests have been the most widely used of all tests for this purpose. These tests have been adapted to Braille administration by multiplying standard time limits, where appropriate, by a factor of two and one-half. This is done to compensate for the slow rates at which Braille is read. Some tests have been adapted for oral administration in which the examiner reads all the items to all students taking the test. In this case, variations among scores resulting from speed factors are eliminated.

b. Hayes, S. P. Factors influencing the school success of the blind. Teachers Forum (Blind), 1933-34, 6, 91-98.

Purpose: To determine if the cause of blindness, age of incidence, and other factors influence school success.

Subjects: Groups of from 60-500 students tested at large residential schools at all grade levels.

Procedure: Students were tested using standardized tests on various common school subjects.

Results:

1. Cause of blindness was not related to school success.

2. Age of incidence did not appear correlated with school success.

3. Age of entrance into school appeared negatively correlated with school success.

4. There were no significant sex differences in school success.

Comment: Attempts to predict school success from biographical and physical data have met with little success. The dynamics determining academic and other kinds of success for blind children are exceedingly complex; hence it is necessary to consider each blind child as a distinct individual and plan education accordingly.

c. Merry, R. A. A survey of the problem solving ability of pupils in six residential schools for the blind. Teachers Forum (Blind), 1931, 3, 12-15.

Purpose:

1. To determine the ability of blind children to analyze simple arithmetic problems and to compare these results with those obtained with seeing children.

2. To indicate outstanding difficulties of such children in problem solving and to suggest types of remediation.

Subjects: 170 pupils in grades 4-6 from six representative residential schools.

Procedure: The Stevenson Arithmetic Reading Test I, Form 2 (Problem Analysis) was Brailled and administered by teachers in the schools. The test required no calculation, but the child was required to answer questions about (1) the facts given, (2) what to find out, (3) how to select the most reasonable answer, (4) to indicate the process used in solving the problem.

Results:

1. Blind children compared favorably on this test with seeing children in the same grade. However, blind children were older than seeing children in the same grade.

2. Both blind and seeing did well at determining what is to be found out in the

problem and the process necessary to its solution, but needed instruction at enumerating facts given and estimating answers.

Comment: The problems experienced by blind children in arithmetic achievement were indicated in the results of (a) above. The results of this study indicate that such difficulty is not a consequence of lack of ability in the type of comprehension and reasoning required to attack arithmetic problems.

d. Nolan, C. Y. Achievement in arithmetic computation. (Analysis of school differences and identification of areas of low achievement) Int. J. educ. Blind, 1959, 8, 125-128.

Purpose: To make an analysis of differences in achievement in arithmetic computation among several schools for the blind and to identify tentatively types of arithmetical operations where achievement is low.

Subjects: Braille adaptations of Form J of the Stanford Achievement Computation Tests were administered to children in 9 residential schools for the blind. The Primary Level Test was taken by 77 children in grade 3.2; the Elementary Level Test by 70 children in grade 4.2; the Intermediate Level Test by 57 children in grade 6.2; and the Advanced Level Test by 78 children in grade 8.2.

Procedure: The adapted tests consisted of two forms administered on successive days by the classroom teachers. The two lower level tests required the child to record his answer on a separate sheet of paper with a Braillewriter. The two upper level tests were a multiple choice type which required the student to underline the most appropriate of four answers. Braille problems were presented exactly as in the print edition. Time for each form was set at 45 minutes.

Results:

1. Significant differences in mean achievement existed among schools at each grade level. The extent of school differences increased with grade level.
2. The rank order of achievement for schools appeared stable over all four grades.
3. Specific arithmetic operations giving difficulty for at least 60% of the pupils

at each grade level were identified.

Comment: The results of this study, when considered along with those in item c above, seem to indicate that the problem in arithmetic achievement stems from some other source than mental ability. The great differences in achievement among schools indicate that research in arithmetic teaching methods may be a fruitful approach to this problem.

e. Hayes, S. P. Words are wise men's counters (Hobbes): How rich are the blind? Teachers Forum (Blind), 1938, 10, 94-103, 108.

Purpose: To determine how efficient blind children are in the understanding of words.

Subjects and Procedure: 443 individuals (ages 10-23+) were tested using Terman's English Group Vocabulary Test. 180 children in grades 4-9 were given the Stanford Achievement Test, No. 2, Word Meaning.

Results: The results indicated an inferiority in the understanding of words among the blind about equal to their retardation in the early grades, with a progressively greater inferiority in later adolescence where longer words and specialized, abstract terms form a larger proportion of standard vocabularies.

Comment: Since blind children must acquire many more concepts vicariously than must sighted children and since auditory and tactile communication is slow, growth of vocabulary has long been a matter of interest. This study, as well as others, demonstrates the extent of the effects of the above factors in vocabulary growth.

f. Payne, S. Free association in blind children. Master's thesis, Columbia University, 1931.

Purpose: To compare free association of blind and partially sighted children with those of normal children.

Subjects: 41 children, ages 7-15 years, grades 1-4, in school at the New York

Institute for Education of the Blind. None could see well enough to travel in strange surroundings.

Procedure: The Kent-Rosanoff word list as modified by Woocrow and Lowell was used. Children were required to respond to a stimulus word with the first word that occurred to them following stimulation (free association).

Results:

1. Blind children tended to give 22% fewer specific common reactions to the words.
2. Blind children gave almost three times as many individual responses as did normal children. Perseveration reactions were especially apparent.
3. Blind children showed definite limitation in their fields of association. They gave fewer adequate associations than did normal children.

Comment: Not only is vocabulary growth affected in extent but also in the kind of conceptual relationships formed. Some studies have indicated that the latter effects can be extreme. This research demonstrates a technique that can effectively be used to explore this problem further.

g. Rowe, E. D. Speech problems of blind children: A survey of the North California area. New York: American Foundation for the Blind, 1958.

Purpose: To determine the percent of significant speech defects to be found in the speech of blind children enrolled in schools in Northern California.

Subjects: 73 boys and 75 girls, grades 1-6, ages 6-16 years were studied. 90 children were enrolled in a residential school while 58 were enrolled in public schools. All were legally blind with 74 being totally blind or having light perception only.

Procedure: Measures used included a Speech Inventory filled out by teachers, a tape recorded individual speech test which consisted of naming objects which covered sounds in initial position in words and counting to ten, and a sample of connected speech where the child was encouraged to talk freely. The results obtained

were rated by two trained public school speech therapists.

Results:

1. The percentage of speech defects was low when compared with most school surveys.

2. All defects found were considered to be minor and in no case was the speech defect severe enough to interfer markedly with effective communication.

Comment: Research in speech development has long been of interest in this field. The results of this recent study are in conflict with those of earlier studies where many more speech difficulties were discovered. This paper contains a comprehensive review of earlier work in this area.

Summary: With the exception of arithmetic, achievement of blind children appears to approach that of sighted children at the same grade level. However, blind children are often older than sighted children in comparative grades. Reasons for retardation in terms of age-for-grade are not clear. This may be a consequence of slower rates of communication, differential rates of perceptual development between blind and sighted children, inadequate methods of instruction, or a combination of these and other things. So far as the author has been able to determine, no studies comparing the effectiveness of educational methods for blind children have been made in any subject area.

5. Personality and Social Development and Their Measurement.

Studies in these areas have important, if indirect, implications for education. Because education is a social process in which the child's success depends, at least in part, on the degree of his personal integration and maturity, this material was included. Major research interests in this area have been the adaptation of standardized tests for use with the blind, comparison of development of personality between blind and sighted groups and investigation of some of the dynamics of personality development.

Efforts to adapt personality tests for use with the blind have compounded the problems intrinsic to these tests with those of content and concurrent validity for the blind previously discussed.

a. Maxfield, K. E. & Fjeld, H. A. The social maturity of the handicapped preschool child. Child Developm., 1942, 13, 1-27.

Purpose: To determine the usefulness of the Vineland Social Maturity Scale as a measure of the general social competence of visually handicapped children.

Subjects: 101 visually handicapped children ages 9 months - 6 years, 10 months.

Procedure: The first 77 items of the Vineland Social Maturity Scale were used as a basis for this study. The effects of differing degrees of blindness and intelligence upon total scores and individual item scores were investigated.

Results:

1. 20 items were found useful without revision, 31 with revision, and 36 new items were included to constitute a revised scale.
2. The results definitely indicated that these children, as a group, were retarded on specific items, and appear to be more docile, less active, and have less initiative than seeing children of corresponding ages.

Comment: A major problem for early education is identifying that point in life when young blind children have reached a level of development which will permit them to enter school. This research describes the adaptation of a scale which may be used for this purpose. Implied in the results is the extent of the problem of content validity for revision of this test.

b. Scholl, G. Some notes on the use of two personality tests with visually handicapped students. New Outlook Blind, 1953, 47, 287-295.

Purpose: To describe the use of the Bell Adjustment and Bernreuter Personality Inventories with the blind and to summarize results of their use.

Subjects: 62 students were given the Bernreuter and 52 eleventh graders were

given the Bell. All were enrolled in a residential school for the blind.

Procedure: Both tests were recorded and administered by means of a tape recorder. Individual administration was used with the subject responding by putting numbered cards in appropriate boxes.

Results:

1. Bernreuter: Blind girls appeared better adjusted than blind boys on the scales measuring neurotic tendency, self sufficiency, and dominance-submission (B1-N, B2-S, and B4-D).

2. Bell: Blind children averaged within the normal range for the Home, Health, Social, and Emotional Scales. Boys appeared superior to girls on the Home Scale and Emotional Scale. On the Total Scale the median for boys fell within the Average norm category and the median for girls fell within the Unsatisfactory category.

Comment: A number of paper and pencil personality tests have been adapted for use with the blind. Such tests have been read orally to groups, Brailled, or recorded and presented individually or to groups. Test scores have been analysed to describe personal adjustment of blind groups in terms of test norms. Findings of such studies have varied widely with little consistency among the several studies reported in the literature.

d. Sommers, V. S. The influence of parental attitudes and social environment on the personality development of the adolescent blind. New York, American Foundation for the Blind, 1944.

Purpose: To evaluate the influence of parental attitudes and social environment on the behavior and personality development of the adolescent blind.

Subjects: 68 boys and 75 girls with no useful vision who lost their vision before 6 years of age. Subjects ranged in age from 14-21 years, and in grade level from 8-12. Intelligence ranged from low average to very superior.

Procedure: All subjects were administered the California Test of Personality (CTP) and a questionnaire on attitudes and adjustment. 72 mothers filled out a similar questionnaire for their children. For fifty subjects, intensive interviews

c. Hayes, S. P. An interest inventory for the guidance of the blind. Outlook for the Blind, 1948, 42, 95-104.

Purpose: To describe an adaptation of the Kuder Preference Record and give results of its use.

Subjects: 58 boys and 33 girls (CA range 13-22 years, MA range 12-22 years) enrolled in the Upper School at Perkins School for the Blind.

Procedure: The test was given orally to groups, subjects responding by making pencil marks on appropriate dots on a Braille multiple-choice answer sheet. Some individual items were changed to conform with capacities of the blind.

Results:

1. The interests of boys were high in the Musical and Clerical areas, low in the Mechanical and Computational areas, and below the median of norms for other areas.
2. The interests of girls were high in the Persuasive, Literary and Music areas, and at or below the median for other areas.
3. No reliability estimates were available.
4. High agreement existed (r= .62 - .95) between teachers ratings on possible success and interest scores of students for the Musical, Mechanical, Computational, and Literary areas. Low agreement (r= .08 - .24) was found for the Persuasive and Clerical areas.

Comment: This is one of the few studies representing test adaptations in the interest and aptitude areas. Lack of availability of large numbers of subjects entering specific educational or vocational areas has prevented research on the predictive validity of the various standardized interest and aptitude tests.

were conducted both with parents and children.

Results:

1. Results from the CTP indicated that (a) blind adolescents as a group fell below the norms of the seeing with respect to personal and social adjustment and (b) blind girls seemed to be slightly better adjusted than blind boys. (However, the author concluded that due to the nature of many of the test items, these findings lacked validity.)

2. Answers to questionnaires indicated that "frustrations or maladjustments or emotional disturbances result more frequently from the social attitudes and conditions surrounding the blind person and brought about by the presence of the handicap, than from the sensory disability itself."

3. "Interviews with parents disclosed that the majority of mothers studied experienced frustrations or feelings of conflict because of having given birth to a blind child.....(these) seemed to arise from a sense of unfulfillment resulting from the fact that the birth of a child with a handicap as apparent as blindness failed to meet the concept of the kind of child which the mother had expected; while the contradiction between maternal devotion and an irrepressible sense of repulsion caused by the blindness seemed to create feelings of irreconcilable conflict. These...feelings...(resulted in) a sense of guilt which frequently was associated with self-consciousness or a sense of inferiority."

4. Reactions of parents to children fell into five fairly distinct categories: (a) genuine acceptance of the handicap and devotion to the child, (b) an attitude of denial that either parent or child is affected by the handicap, (c) overprotectiveness and excessive pity, (d) disguised rejection, and (e) overt rejection.

5. Adolescents displayed a variety of adjustive behavior closely related to the reactions of their parents (particularly mothers) to their handicap. These included (a) wholesome compensatory and hypercompensatory behavior, (b) denial reactions, (c) defensive behavior, (d) withdrawing tendencies, and (e) nonadjustive reactions.

Comment: See item e.

e. Verrillo, R. T. A study of adjustment and the relationship between parental attitudes and adjustment in visually impaired and sighted adolescents. Ph.D. thesis, University of Rochester, 1958.

Purpose: To determine the relationship between the attitudes of parents and the adjustment of groups of visually handicapped and sighted adolescent offspring.

Subjects: The visually handicapped group included 12 totally blind, 28 legally blind, and 31 partially sighted children who were living with their parents. These were matched in age, grade placement, intelligence, and socio-economic status with a group of 40 normally sighted children. Mothers were also contacted. All children had attended public schools for at least three years prior to the study.

Procedure: Two measures of adjustment of children were obtained: the Self-Ideal Sort of attitude items by children and a Teacher's Behavior Rating Scale. Perceived attitudes of parents were indicated by the children on a Situations Projective Test - B. Parents completed a Master Scale which measured parental child rearing attitudes. Attitudes of children as perceived by parents were tapped through the Situations Projective Test - A.

Results:

1. No significant differences in adjustment were found between visually impaired and normally sighted groups or between sexes within or between groups.
2. For the handicapped group, no significant relationships were found between publicly expressed maternal attitudes and adolescent adjustment.
3. Adolescent adjustment in both groups was significantly related to children's perception of attitudes of rejection and acceptance in parent figures.
4. Children's perceived attitudes and parental attitudes were significantly related.
5. High socio-economic status was positively related to adjustment of children and attitudes of overprotection, dominance, rejection, anti-minority, and authori-

tarianism.

6. In the visually handicapped group, attitudes toward blindness became significantly more negative as ages of children increased.

Comment: Studies d-e represent attempts to define and relate factors important to personality development. These studies of intrafamily relationships and their implications for personal adjustment demonstrate the effects of these factors and also that such effects are not specific to the blind. The Q-sort method demonstrated in study (e) is an example of one of the more rigorous experimental approaches to the problem of personality development.

f. Kent, H. R. The effect of repeated praise or blame on the work achievement of blind children. Ph.D. thesis, Columbia University, 1956.

Purpose: To determine if motivational needs differ among sighted children, blind children in public schools, and blind children in residential schools.

Subjects: Three groups matched for age included 60 pupils from residential schools for the blind, 43 blind pupils from New York City schools, and 60 sighted children from the same schools. A control group included 30 blind children from residential schools.

Procedure: All subjects in the first three groups were given the Introversion-Extraversion Scale of Aspects of Personality by Pintner, et. al. Those scoring above median were classed as extraverts and those below as introverts. Half of the extraverts were randomly chosen to receive praise and half to receive blame while given a series of trials on a cancellation test. Similar conditions were applied to the introverted group. The control group took the cancellation test but received neither praise nor blame.

Results:

1. Either incentive was more effective than none for residential school blind children, but praise only was effective for public school blind children. The effect for the latter group was less intense.

2. Regardless of personality type, praise was found to be a more effective motivator than blame for all groups.

3. Degree of achievement, in response to either motivational variable, proved to be the same for the sighted and residential blind groups. Both of these groups significantly exceeded the public school blind.

4. The major conclusion was that blind children could not be considered a homogeneous group with respect to the motivational processes investigated, and, like sighted children, they were influenced by environmental circumstances.

Comment: The social implications of the various types of educational programs for the motivation, social integration, and self-concept development of blind children have not been explored. This study is of interest because of the question it leaves unanswered. Why did blind children in public school classes react as they did?

Summary: There are no indications that the dynamics of personality development in the blind differ from those of other groups. Social factors within the home and school environments appear important in the personality development of blind children.

6. Physical Development and Its Measurement.

The physical development of blind children has received little study. However, physical development with its implications for general health and better mobility are of tremendous importance to the over-all well-being of blind children.

a. Buell, C. E. Motor performance of visually handicapped children. Outlook for the Blind, 1950, 44, 256-268.

Purpose: To measure the gross motor performance of blind and partially seeing children.

Subjects: 865 children in twelve residential schools and eight Braille classes served as subjects. (36% had no useful vision; 25% of these had lost vision after 6 years of age; more than 50% had attended a special school for at least six years;

27% of the blind and 11% of the partially seeing were classified as over-protected.)

Procedure: The children were given a battery of tests including the 50-yard dash, the basketball throw for distance, the standing broad jump and the Iowa Brace Test.

Results:

1. Visually handicapped children scored far below seeing children. No one factor -- body control, static balance, coordination, or agility, seemed responsible.
2. Limited physical activity (due to lack of vision and over-protection by parents) appeared to be the major reason for this finding.
3. Physical performance by the blind was as consistent as that of the sighted.
4. The partially seeing in general exceeded the totally blind on all tests. This difference usually disappeared at the high school level.
5. Over-protected children scored lower than those from normal environments.
6. Children who lost their vision after 6 years of age had less difficulty adjusting to physical activities than those who lost their vision earlier.

Comment: This study is characteristic of initial researches in that its purpose is to explore and to define, for further research, specific aspects of a more general problem area. As such, the approach to the problem area is generalized and normative.

7. Research Status of the Field.

With few exceptions lack of integration characterizes previous research in the education of blind children. As is implied by the articles reviewed, much research has been of a normative nature comparing the blind with the sighted for numerous types of behavior. The quality of research in terms of design, execution, statistical analysis, and reporting has often been quite disappointing. Many studies have involved groups which were too small and which did not represent the populations for which inferences were to be made.

These criticisms exemplify the necessity for establishing long range integrated research programs. Such programs should be under the direction of social scientists who have thorough training in research techniques and in the subject matter specific to their areas of study. In order to solve the problem of sampling, research programs must have resources that will enable them to draw subjects from throughout the United States as required. General research problems which need further study are indicated below under the appropriate area.

1. Sensory and Perceptual Factors Relevant to Education.

Further studies of haptic perception of form are urgently needed. Space perception as a function of auditory and haptic cues should be explored further in order to better understand and solve problems in mobility. The effects of sensory deprivation upon development of perceptual processes appears an important problem for study.

2. Educational Media and Their Use.

Perceptual factors in Braille reading such as cues in recognizing whole words and tactual span have yet to be investigated. Description is needed of perceptual and learning factors in listening which are related to the educational process. Problems in graphic communication which are closely related to those of tactual form perception need intensive study. Development of satisfactory devices for arithmetical computing and description of methods for their use are important. Study should be made of the applicability of teaching machines to the visually handicapped population.

3. Intelligence and Its Measurement.

Verbal intelligence tests, both individual and group, which have content and concurrent validity for both blind and sighted groups are needed. Also needed are performance scales of intelligence for blind children.

4. Educational Development and Its Measurement.

Further research on problems of concurrent validity of achievement tests should be undertaken. Research to identify the best teaching methods for reading,

arithmetic and geography has yet to be carried out. Concept development and vocabulary development in preschool and primary level children need further study.

5. Personality and Social Development and Their Measurement.

The implications of the various types of educational programs for the social integration and self-concept development of blind children should be explored. Research in this area particularly needs improvement in sampling procedures, control procedures and instrumentation.

Section II - Large-Type Readers

The material in this section describes studies of groups among visually handicapped children who characteristically employ large-type as a principal medium of education. These children are often termed "partially seeing" children. The vision of children falling within this group may range from approximately 20/70 in the better corrected eye down to visual acuities of 20/200 or lower which fall within the legally accepted definition of blindness. Such children are educated as seeing children. It is estimated that approximately 78,000 potential large-type readers are enrolled in public schools in the United States; however, only 11% of these are receiving special help.*

Specific research studies dealing with factors in the education of large-type readers are few. Causes for this are not clear. Some explanation for lack of research with this group may lie in the manner in which they are perceived. In accounting for lack of research on the large-type reader, Lowenfeld** aptly states, "He is, for all practical purposes, a seeing child, and his handicap, if it is one, does not affect him in any different way from other children who slightly deviate from 'the normal'."

For the convenience of the reader, the material has been organized under the following research categories:

1. Educational Media
2. Intelligence Testing
3. Educational Development
4. Personality and Social Development

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* APHA discussions of eye problems. Sight-Saving Rev., 1959, 29, 96.

** Lowenfeld, B. Psychological problems of children with impaired vision. In W. M. Cruickshank (Ed.), Psychology of Exceptional Children and Youth, Englewood Cliffs, N. J.: Prentice-Hall, 1955, pp. 214-283.

1. Educational Media.

A variety of special media are utilized in the education of partially seeing children. However, empirical research on media has dwelt almost entirely with legibility of textbook materials. Type size and style have been the principal subject of interest. No unanimity of opinion exists to this day concerning the size of type most satisfactory for large type books. Types used in the past have included 18-point, 24-point, and 32-point sizes. (Approximately 72 points make an inch.) The following summaries deal with textbook legibility.

a. Fortner, E. N. Investigation of large type books. Proceedings, American Association of Workers for the Blind, 1943, 78-81.

Purpose: To compare ease of reading for material in 18- and 24-point type under standardized conditions.

Group: 39 normal-sighted public school children, grades 4-6, ages 9-14, and 56 children with defective vision, grades 4-12, ages 9-18. Visual defects included myopia, cataract, astigmatism, albinism, corneal opacities, optic neuritis, retinitis pigmentosa, chorio-retinitis, amblyopia, optic atrophy, dislocated lens, strabismus, coloboma, microphthalmia, and hyperopia. Range of vision was from less than 20/200 to 20/20.

Procedure: Children were required to read 521 word selections from a 4th Grade cleartype reader printed in 24- and 18-point Goudy bold print under standard light conditions. Eye blink-rate was used as a criterion of ease in seeing. Reading time was recorded.

Results:

1. No significant difference in involuntary blink-rate for 24- and 18-point type was found; therefore it was concluded both were equally legible.

2. 75% of the children approved 18-point type because it permitted a greater eye span.

Comment: see comment after reference (b)

b. Nolan, C. Y. Readability of large types: A study of type sizes and type styles. Int. J. educ. Blind, 1959, 9, 41-44.

Purpose: To determine the comparative readability of type of two styles and of two sizes.

Subjects: 264 children of both sexes, grades 4-12, ages 8-20 years, whose IQ's exceeded 69. One-half the group was legally blind with vision in the better corrected eye ranging from 20/200 - 2/200. Range of vision for the remainder was 20/40 - 20/160. The children were enrolled in sight-saving classes in 47 public schools and residential schools for the blind in Ohio, Illinois, and Kentucky.

Procedure: A treatments x treatments x levels design was used. The treatments consisted of comparison of 18-point and 24-point type and of comparison of a common type face (Antique with Old Style) with an experimental type. Two visual levels were employed; legally blind children and non-legally blind children. The criterion used was reading speed which was measured by a 30-minute test based on the 1942 edition of Gates Basic Reading Test, Grades 3-8.

Results:

1. Groups of both legally blind and non-legally blind large-type readers read 18-point and 24-point type with equal speed.

2. A common school book type was found to be more legible than an experimental type.

3. Average reading speeds were 91 words/minute for the legally blind group and 106 words/minute for the non-legally blind group.

Comment: Studies (a) and (b) give results which support the view that 18-point type is as legible as 24-point type. (From the cost standpoint, 18-point type is more desirable because of lower cost of texts.) Studies, the findings of which support the greater legibility of 24-point type, are said to have been made. However, these were not available in published form at the time of writing. Other criteria than reading speed and eye-blink rate may be pertinent in evaluating relative legibility of types.

The low reading speeds reported emphasize the need for exploring the efficiency of other media for communicating educational information to this group.

c. Nolan, C. Y. A study of pictures for large type books. Int. J. educ. Blind, 1960, 9, 67-70.

Purpose: To evaluate a method of legibly reproducing colored pictures in black and white for use in large-type books.

Subjects: 28 boys and 12 girls who were large-type readers, ranging in age from 11-20 years and in grades 5-10. Visual acuities in the better corrected eye ranged from 20/50 - 10/200. 70% of the group was legally blind.

Procedure: Black and white tracings of 5 different colored pictures were made observing three general rules: (1) Contour was emphasized as a cue to form perception, (2) figure-ground relations were emphasized where possible, and (3) extraneous detail or clutter was omitted from pictures where possible. Four variations in black and white tracings were made for each picture: (a) a simple line drawing, (b) a line drawing with areas blacked in for contrast, (c) a line drawing with blacked areas and light shading, and (d) a line drawing with blacked areas and heavy shading. The method of paired-comparison was used to compare each variation of each picture with every other variation as well as with a black and white photo-offset print of the original colored picture.

Results:

1. A traced picture consisting of a line drawing with areas blacked in for contrast was judged more legible than other modes of presentation 75% of the time.
2. Any mode of black-white tracing of colored pictures was judged to be more legible than its black-white photo-offset counterpart.

Comment: Large-type reproduction of regular textbooks is accomplished through the photo-offset process and books are printed in black ink on a lightly-tinted buff or off-white paper. High costs prohibit complete reproduction of textbooks in color. Results of attempts to reproduce originally multicolored pictures or

maps in black and white have ranged from pictures where clearness of contour and distinctiveness of figure-ground relationships were slightly diminished, to those where the whole picture appeared one area of almost equally dark greys. The above study describes the evaluation of methods of inexpensively reproducing legible pictures.

2. Intelligence Testing.

Standard individual intelligence tests with both verbal and performance scales can be used with many partially seeing children. Loss of validity can result for timed tests of both verbal and performance abilities when individual visual loss is sufficient to seriously impair rate of visual or manual behavior and their coordination. No special adaptations of intelligence tests are currently available for use with large-type readers.

a. Pintner, R. Intelligence testing of partially sighted children. J. educ. Psychol., 1942, 33, 265-72.

Purpose: To compare regular and enlarged forms of the Revised Stanford-Binet Tests of Intelligence in the testing of partially sighted children.

Subjects: 602 partially seeing children most of whom were 10-12 years old.

Procedure: The children were tested and retested using both regular Stanford-Binet materials and enlarged materials for this same test.

Results:

1. The mean IQ for the group when tested with enlarged materials was 95. (However, the author comments that this may be an underestimate because of the large numbers of children in the sample who came from bilingual homes.)

2. When divided into groups according to amount of vision, no difference was found between a group having 20/70 to 20/200.

3. No differences were found between test results obtained by regular forms and enlarged forms of the test. However, a study of previous IQ's obtained from many

different kinds of tests showed on the whole lower IQ's than those obtained by the enlarged Binet.

Comment: see comment after reference (b).

b. Livingston, J. S. Evaluation of an enlarged test form used with the partially seeing. The Sight-sav. Rev., 1958, 28, 37-39.

Purpose: To discover clues to intelligence strengths and weaknesses of partially seeing children and to determine whether enlarging the revised Stanford-Binet Intelligence test would increase their scores.

Group: 60 partially sighted children, ages 8-9, vision of 20/70 - 20/200, and mean IQ of 98.6, were compared to 407 normally seeing children with mean IQ of 103.3.

Procedure: Visually handicapped groups were split, matched and compared on Form L of the Stanford Binet, with the experimental group being tested on a photographic enlargement of the tests. The visually handicapped were compared with the sighted on 11 categories of mental functioning developed from the test.

Results:

1. No difference was found among IQ's of partially sighted groups compared on the basis of scores from regular test forms and a photographic enlargement of these.
2. The partially seeing were inferior to the sighted in visual motor coordination but were superior on two abstract word tests. The general conclusion drawn was that no major differences existed between these two groups in several categories of mental functioning.

Comment: Both studies (a) and (b) demonstrate the usefulness of standard test materials with most partially seeing children. No great direct relationships have been found between intelligence and visual acuity. However, in testing partially seeing children it is important to consider each child individually in determining what specific measures are most applicable. No attempts to adapt group intelligence tests for this subpopulation are reported in the literature.

3. Educational Development.

Attempts to describe the educational achievement of large-type readers have been few. Most of these attempts were made in the 1920's. An example of these efforts is provided below. The principal reason for lack of recent effort to study educational development appears to be the absence of measuring instruments for this purpose. Since 1958, a series of standardized achievement tests in large-type has been available from the American Printing House for the Blind. The growing use of these tests opens the way for large scale study in this area.

a. Peck, O. S. Reading ability of Sight-Saving Class pupils in Cleveland, Ohio. Sight-sav. Rev., 1933, 3, 115-126.

Purpose: To determine the reading ability of large-type readers.

Group: Approximately 234 children in grades 2-9 who were enrolled in Sight-Saving Classes in Cleveland, Ohio, during the years 1932-33.

Procedure: The subjects were tested and retested after one year. The Stanford Achievement Test in Reading, Form A, was reproduced in large-type for this purpose. Scores recorded were based on time limits allowed children in regular classes as well as a limit allowing one-and-one-half regular time.

Results:

1. Median reading achievement for all grades was close to the respective norms for each grade.

4. Personality and Social Development.

Studies in this area are predominately comparisons of the personal adjustment of partially seeing children with that of other groups or studies of attitudes of others toward such children. Problems of validity equivalent to those described for intelligence tests may occur in use of standardized personality tests with some members of this group. No especially adapted tests of personality or social development are currently available for use with this group.

a. Pintner, R. & Forlano, G. Personality tests of partially sighted children. J. appl. Psychol., 1943, 27, 283-87.

Purpose: To determine if differences in personality exist between groups of children enrolled in sight-conservation classes and groups enrolled in regular classes.

Subjects: 874 partially sighted children in elementary, junior high, and high school classes.

Procedure: Children were administered The Aspects of Personality Test and Pupil Portraits Test. These group tests were reproduced in large type for this purpose.

Results:

1. Generally, partially sighted children showed no marked average deviations from normal children in factors of ascendance, extroversion, emotional stability, school adjustment and home adjustment. The most probable group deviation was shown by partially sighted girls who seem to be more introverted than normal girls.

Comment: No general or marked differences in personality development have been found among partially sighted groups and others. Comparisons on this topic have been few and the measuring instruments used inadequate. In the general literature, however, belief is often expressed in the existence of significant numbers of personality problems within the partially sighted group.

b. Underberg, R. P. The relationship between parental understanding and child adjustment in the visually disabled adult. Doctoral thesis, Univ. of Rochester, 1958.

Purpose: To test the hypotheses that good parental understanding is related to good child adjustment, high child perception of acceptance, and low child perception of rejection in groups of visually disabled and sighted adolescents. In addition it was hypothesized that the sighted group is characterized by better adjustment, higher perceptions of acceptance and better parental understanding.

Subjects: 40 sighted, 12 totally blind, 28 legally blind and 31 partially sighted children and their mothers. Children were from grades 7-12 in public schools in cities in New York state. Groups were closely matched on sex, age, educational level, IQ, and socio-economic status.

Procedure: All children were administered two tests that measured adjustment, a measure of self-concept, and a projective test which measured child perceptions of pity, overprotection, rejection and acceptance. Teachers ratings of children's adjustment were obtained. Parental understanding was measured by the magnitude of the difference between parental prediction and the actual response of their children to the measures of self-concept and the projective test. Parents also predicted self-concept for an "average" child.

Results:

1. For sighted children accurate parental prediction of self-concept was significantly related to all measures of adjustment and perceived acceptance and rejection as predicted.

2. For the experimental groups, significant relationships appeared between accurate parental prediction of self-concept and the self-concept measures of adjustment.

3. Group differences in child adjustment, child perception, and parental understanding were generally not significant. However, the partially sighted group might possibly be characterized by somewhat greater child perception of pity and somewhat poorer parental understanding.

4. Parental predictions of self-concept for the "average" child were closely related to those made for their own child except for the partially sighted group whose mothers, as opposed to the others, perceived their children as being different from the average.

5. Generally it is believed that the study findings support the idea that the parent-child relationship is a fundemental influence upon adjustment, the operations of which are similar for both sighted and visually disabled adolescents.

Comment: The findings of this study indicate that less understanding may exist between partially sighted children and their parents than is usual in similar relationships involving normally sighted or blind children. Lack of understanding between partially sighted children and individuals in a variety of situations is frequently mentioned in the literature. This is believed to result from differences which occur between the expected and observed behavior of these children. Since from outward appearances many such children seem normal, parents and others have normal expectancies for the child's behavior and its growth. When expression of the handicap prevents normal growth or causes aberrant behavior, this is judged to result from lack of intelligence, clumsiness, or sheer perversity on the part of the child.

c. Force, D. G., Jr. Social status of physically handicapped children. Except. Child., 1956, 23, 104-107, 132-133.

Purpose: To compare physically handicapped and normal children in integrated classes at the elementary school level to determine the effect of physical disability upon social position among peers.

Subjects: 63 physically handicapped and 361 normal children of average intelligence in 14 elementary classes (grades 1-6) of 3 Michigan schools were used, including 7 visually handicapped children.

Procedure: A near-sociometric instrument was used to reveal choice behavior on three criteria - friends, playmates, and workmates. Teachers rated all children for outstanding positive and negative behavior traits. Data were analyzed using deviation-from-chance-expectancy techniques.

Results:

1. Physically handicapped children were not as well accepted as normal children in integrated classes at the elementary school level. (Visually handicapped children received significantly lower numbers of choices on all criteria than normal children.)

2. Psychological identification of subgroups of normal children and physically handicapped children was made by elementary school children in their choice behavior.

3. Physical disabilities have varying social values with cerebral palsy ranking lowest on the value scale. (Visual disability ranks next lowest.)

4. The individual physically handicapped child who is highly accepted by a peer group manifests many socially desirable traits and relatively few negative traits. Few such children have enough positive assets to offset completely the negative effect of being labelled as handicapped by normal peers.

Comment: Much has been said and written in the last three decades concerning the necessity for integrating the visually handicapped in the main streams of society. Many educators have naively assumed that the simple juxtaposition of the visually handicapped and sighted within an educational setting would assure this occurence. The above study amply demonstrates that placing handicapped children within regular classes is only the initial step in their integration.

d. Murphy, A. T. Attitudes of educators toward the visually handicapped. Sight-sav. Rev., 1960, 30, 157-161.

Purpose: To measure the attitudes of educators toward groups of exceptional children.

Subjects: 100 elementary classroom teachers, 32 elementary school principals, 46 special educators, 100 college freshmen in teacher training, and 31 speech clinicians.

Procedure: Teachers ranked 8 categories of exceptionality according to the type they would prefer to teach and the type for which they knew most about. Categories included the visually handicapped, mentally retarded, emotionally disturbed, crippled, hearing handicapped, gifted, speech disordered, and delinquent.

Results:

1. Children with visual handicaps were ranked lowest or next to the lowest in

preference and knowledge by all teacher groups except the special educators.

2. Special educators ranked the visually handicapped near the middle of the preference range.

3. Other non-preferred groups were the delinquent and hearing handicapped.

Comment: Negative attitudes toward visually handicapped individuals prevail throughout all strata of our society, even among educators. The impact of such attitudes upon the visually-handicapped individual is likely to have diverse negative effects. The educational implications of such effects can be great.

5. Research Status of the Field.

Twenty years ago, Pintner* commented on the lack of research on the partially sighted and upon our almost total ignorance of the psychology of these children. These comments have almost the same degree of applicability today. Within the last several years, groups have discussed and identified a number of educational research problems relative to this group. As nearly as can be determined, at present there are no concentrated or even sporadic efforts being made to supplement our knowledge of partially seeing children. Some major problems for research in the education of large type readers are listed below.

a. Educational Media

Further studies in the legibility of text materials need to be made. These should include studies of graphic material, pictures, and type. For print, factors such as line length and leading need study. Use of auditory communication in the education of this group should be explored. The implications of the growing use of optical aids for design of text materials need analysis.

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* Pintner, R., Eisenson, J., & Stanton, M. The Psychology of the Physically Handicapped. New York: Crofts & Co., 1941, p. 260.

b. Intelligence Testing

Development of group intelligence tests and study of validity problems arising in the use of standard individual intelligence tests with these children are needed.

c. Educational Development

Collection and analysis of achievement test results should be made in order to evaluate educational progress. It is likely that results of such an analysis will generate a host of specific research problems in this area.

d. Personality and Social Development

Further identification of specific problems in personality and social development arising from visual handicaps is needed. Further test development in this area would be useful. Basic information stemming from these activities could lead to further research on means to help solve problems confronting this group in the personality and social realms.